Claims

What is claimed is:

1. A computer-implemented method of monitoring network performance where performance requirements are already established comprising the steps of:

monitoring a performance-defining metric on a recurring basis to obtain samples of the metric value;

determining a trend in actual service based on obtained samples of the metric;

determining a performance violation time equal to the time at which the actual service will cease to meet the established performance requirements if the determined trend continues.

2. A computer-implemented method as set forth in claim 1 wherein the step of determining a trend is performed using linear regression.

3. A computer implemented method as set forth in claim 2 wherein the step of determining a trend includes the further steps of:

analyzing a set of samples obtained over a predetermined sampling interval to determine whether the analyzed set satisfies predetermined sample criteria; and

terminating the step where the analyzed set fails to satisfy the predetermined sample criteria.

4. A computer implemented method as set forth in claim 3 wherein the step of analyzing a set of samples comprises the step of determining whether the standard deviation of the set is greater than a predetermined percentage of the mean of the sample.

- 16 -

5. A computer implemented method as set forth in claims 1 - 4 including the additional step of generating an alert if the performance violation time is predicted to fall within a fixed time window beginning at the current time.

6. A computer implemented method as set forth in claim 5 including the additional step of canceling a previously generated alert in the absence of a prediction that the performance violation time will fall within the fixed time window.

7. For use in a system wherein at least one network performance metric is required to comply with predetermined requirements, a computer-implemented method for providing an alert, said method comprising the steps of:

   monitoring the provided service to obtain, on a recurring basis, sets of samples representing actual network performance;

   using the obtained sets of samples to generate a mathematical representation of a current trend in the network performance metric;

   using the mathematical representation, predicting the time when the network performance metric will exceed a defined threshold if the current trend continues; and

   generating an alert if the predicted time is within a fixed time window which begins upon execution of the method.

8. A computer-implemented method as set forth in claim 7 including the additional step of transmitting the generated alert to a network operator.

9. A computer-implemented method as set forth in claim 8 wherein the mathematical representation is generated using linear regression techniques.

10. A computer-implemented method as set forth in claims 7 - 9 wherein the step of using the obtained samples includes the additional steps of:

- 17 -

3   calculating predefined statistical parameters of each obtained set of

4   samples;

5   determining whether the calculated statistical parameters meet predefined

6   threshold requirements; and

7   terminating the process if where the calculated statistical parameters for an

8   obtained set of samples fails to meet the predefined threshold requirements.

1   11. A computer-implemented method as set forth in claim 10 wherein the calculated

2   statistical parameters comprise the standard deviation and mean of the set of samples and

3   the predefined threshold requirement requires that the standard deviation be no greater

4   than a predetermined percentage of the mean.

       12. A system for providing an alert indicating a predicted violation of a predetermined

       network performance requirement, the system comprising:

       a performance monitor which obtains sets of samples of a predefined

       service metric on a recurring basis;

       a sample processor which receives the obtained sets of samples and

       generates a mathematical representation of a current trend in service metric

       values;

       logic elements which use the generated mathematical representation to

       predict when the service metric will cross a defined threshold if the trend

10   represented by the mathematical model continues; and

11   an alert generator for generating an alert if the determined time is less than

12   a predetermined time from the current time.

1   13. A system as set forth in claim 12 further including transmitter logic for transmitting

2   the generated alert to a network operator.

14. A system as set forth in claim 13 wherein the sample processor further contains logic for performing linear regression operations using the obtained sets of samples of the predefined service metric.

15. A system as set forth in claim 14 wherein the sample processor further includes:

statistical logic for determining the standard deviation and the mean of each obtained set of samples;

arithmetic logic for determining the ratio of the standard deviation and the mean of each obtained set of samples; and

thresholding logic for terminating any prediction where an obtained set of samples is determined to have a ratio exceeding a predefined threshold.

16. An article of manufacture comprising a computer useable medium having a computer readable program embodied in said medium, wherein the computer readable program when executed in the computer causes the computer to:

receive, on a recurring basis, sets of samples of a service metric obtained by monitoring an actual network performance where the network is subject to at least one predetermined network performance requirement;

determine a trend in actual service based on received sets of samples; and

predict when the service metric will exceed a defined threshold if the determined trend continues.

17. An article of manufacture comprising a computer useable medium having a computer readable program embodied in said medium, wherein the computer readable program when executed in the computer causes the computer to:

receive, on a recurring basis, sets of samples of a service metric obtained by monitoring the actual performance of a network;

ignore any received set of samples which fails to satisfy predetermined sample criteria;

- 19 -

8   determine a trend in actual service metric values based on retained

9   samples; and

10   predict when the service metric will exceed a defined threshold if the

11   determined trend continues.

18

1   16. An article of manufacture comprising a computer useable medium having a computer

2   readable program embodied in said medium, wherein the computer readable program

3   when executed in the computer causes the computer to:

4   receive, on a recurring basis, sets of samples of a service metric obtained

5   by monitoring the performance of a network;

6   use obtained sets of samples in generating a mathematical representation

7   of a current trend in service metric values;

         use the mathematical representation to predict when the service metric

      will exceed a defined threshold if the current trend continues; and

         generate an alert if the elapsed time is less than a predefined time.

19

    17. An article of manufacture comprising a computer useable medium having a computer

   readable program embodied in said medium, wherein the computer readable program

   when executed in the computer causes the computer to:

        receive, on a recurring basis, sets of samples of a service metric obtained

      by monitoring the performance of a network;

6   calculate predefined statistical parameters of sets of obtained samples;

7   determine whether the calculated statistical parameters meet predefined

8   threshold requirements;

9   ignore any set of samples for which the predefined threshold requirement

10   is not met;

11   use retained sets of samples in generating a mathematical representation of

12   a current trend in service metric values;

- 20 -

13   use the mathematical representation to predict when the service metric

14 will exceed a defined threshold if the current trend continues; and

15   generate an alert if the elapsed time is less than a predefined time.